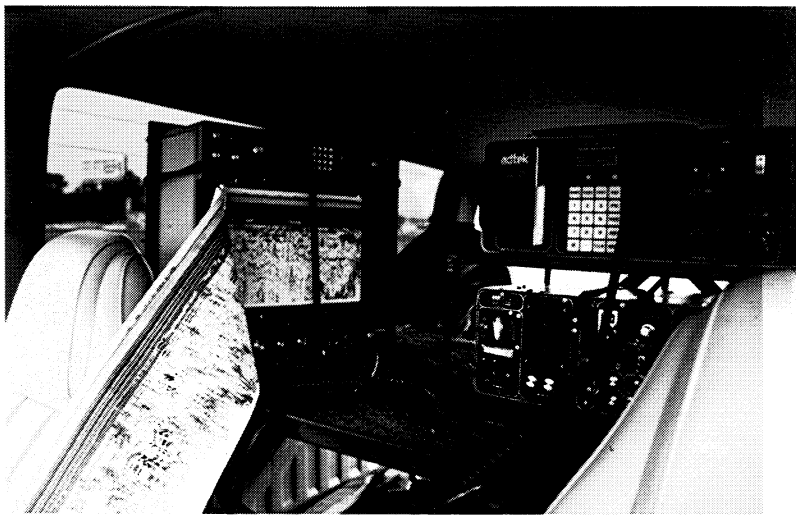
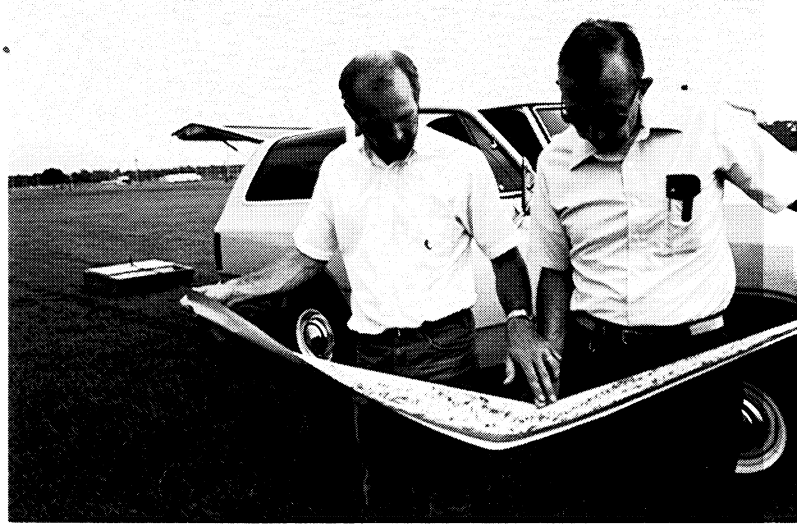
Soil Surveys





Accurate soil surveys are necessary for soil conservation measures, determining building sites, selecting park locations, siting sewage plants and a variety of other reasons. The traditional method of surveying requires auger boring into the ground to obtain subsurface soil samples for classification, a slow and fatiguing process since a typical survey might require hundreds of depth measurements. The U.S. Department of Agriculture's Soil Conservation Service (SCS) is now employing an easier and faster method, developed in cooperation with NASA, that involves use of ground penetrating radar to produce subsurface graphs for interpretation by soil scientists.

At upper right, SCS specialists are surveying an area in Florida. The radar antenna (foreground) is pulled by a four-wheel-drive vehicle along a transect line, a straight line across the surface where normally many borings would be made. As it moves along the transect line at about five miles per hour, the antenna transmits radio waves downward that are reflected back to the antenna when they strike layers—soil, rock, water, man-made objects—of different electromagnetic properties. The antenna relays the reflected pulses to a graphic recorder mounted in the vehicle. The system analyzes the data and produces images on the recorder of subsurface "interfaces," areas where two different types of features meet; the recorder and the radar controls are pictured in the middle photo. In the lower photo, SCS soil scientists examine the recorder's printout; the information does not entirely eliminate the need to dig holes, but only a few are required to double-check the radar's findings. The radar can penetrate to depths of seven to eight feet routinely; in some types of soil it can reach 30 feet or more.

NASA's work in the cooperative project with SCS was performed by Kennedy Space Center (KSC), which studied a number of options to circumvent the limitations of earlier methods of soil surverying—for example, sonar, gravity techniques and geophysical sounding devices. KSC's investigation concluded that ground penetrating radar offered the most advantageous way of obtaining continuous real-time subsurface observations. KSC's study was followed by comprehensive field testing in Florida, conducted jointly by NASA, SCS and Technos Inc., Miami, Florida. The radar system, manufactured by Geophysical Survey Systems, Inc., was purchased by SCS for operational use, initially in Florida; its successful operation in several Florida projects led to purchase of a second unit.